

Astrometric Error Estimates with Limited Bandwidth in SIM

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Abstract

The Space Interferometry Mission (SIM) is designed to measure stellar positions to a precision of 1-10 μas . The three on-board interferometers measure guide- and target-star fringe delays with an accuracy of 50 pm. Forty-channel spectrometers are used in SIM for fringe detection and acquisition. It is important to analyze fringe measurement error sources to reach unprecedented astrometric accuracy for detection of extra-solar planets.

An assumption of monochromatic light simplifies the study of instrument sensitivities. The true system visibility is definitely smaller than the visibility under the monochromatic assumption. Given the limited spectral bandwidth of the mirrors and the detection systems, stars of different colors will have significant different fringe measurement accuracies. In this paper we provide an estimate of fringe visibility and phase accuracies. A key parameter for SIM is the system visibility. We consider spectral responsivity and quantum efficiency of various detectors, and estimate the delay measurement error for different types of guide stars and grid stars.

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